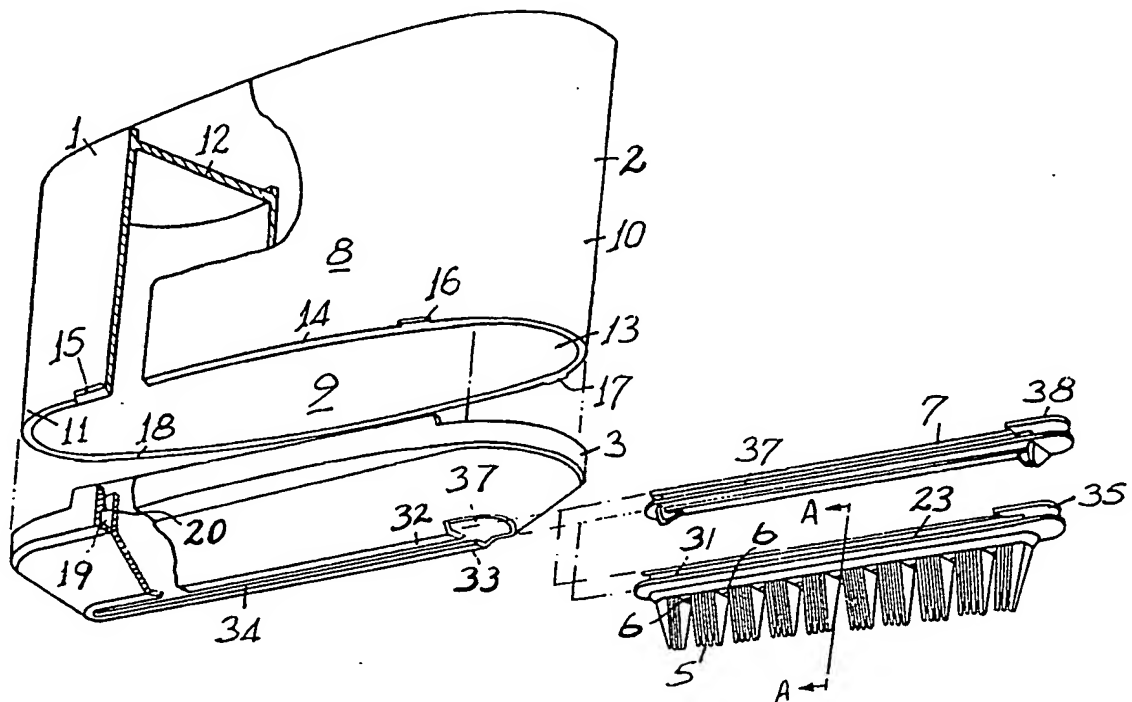


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**(54) Title:** HAIR TREATMENT LIQUID DELIVERY APPARATUS



**(57) Abstract**

A hair treatment liquid delivery apparatus for streaking or tinting hair and including a squeezable container (2) which has removably connected to an otherwise open mouth, an adapter (3) which provides a converging path for viscous bleaching or tinting liquid expelled by the squeezing action from the container (2) and into, in uniform manner, a plurality of apertures (6) at the base of a plurality of slots divided by comb-like arranged teeth (5). Also disclosed as an applicator is a touch-up brush.

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# HAIR TREATMENT LIQUID DELIVERY APPARATUS:

This invention relates to a hair treatment liquid delivery apparatus which has particular application for effecting streaking of hair but is also useful for applying tint selectively to the roots of hair.

- 5 It is a well known procedure to apply bleaching chemicals to only selected strands of a person's hair.

Hitherto, the conventional technique for achieving this has been to cover the head of the person, and therefore the hair, with an impervious  
10 membrane such as a rubber cap with a number of holes therethrough, and selected strands of hair are then pulled using a hook, through the individual holes in the cap.

The hair pulled through can then be selectively treated with tint or bleach  
15 as required.

This procedure is both extremely time consuming and very painful for the person having their hair streaked.

- 20 There have been many previous devices proposed for delivery of hair treatment liquid.

There have been, for instance, devices which have been designed to dispense hair oil through the base of slots within a conventional comb-  
25 like shape.

Such a device is typically as shown in United States patent no. 2,755,807 or United States patent no. 2,607,355.

- 30 The use of bleach or tint instead of hair oil provides a quite different set of problems related to the delivery apparatus and to resultant effects on the hair.

Firstly, in order to achieve a streaking effect with a liquid which will not  
35 inherently spread to all of the adjoining hairs, means the liquid must be

substantially viscous and this immediately causes another set of problems relating to the uniformity of delivery.

5 It means, for instance, that one cannot use a narrow regulating channel such as that shown in Jorgensen United States patent no. 2,755,807 in that the pressure loss along such a channel using a viscous liquid would be unacceptably high so that any delivery rate of fluid from the apertures would be significantly different as compared to those closer to a pressure centre.

10 The same can also be said of a device such as that shown in United States patent no. 2,956,570 in which there is shown a long parallel sided conduit by which liquid can be provided into apertures in the base of slots within a comb-like shape.

15 Specifically, the problem is that bleach or tint, having to be viscous has not been regarded as especially appropriate for dispensing from a manually applied pressure device.

20 Distinct from hair oil type dispensing devices therefore, there have been more recently devices intended for the application of applying bleach or tint to a person's hair.

25 Typical of these is United States patent no. 3,570,499 in which all of the container is a substantially resilient member.

30 The problem with this arrangement is that it is very difficult to ensure that any pressure that might be applied by the fingers of an operator squeezing the container will result in this pressure being substantial and being effective in causing the liquid to flow from the outlets unless the size of the outlets is substantial.

35 The reason for this is that any initially applied pressure will have the immediate effect of expanding other parts of the container not subject to this pressure.

The difficulty with a wide outlet is that any material is then dispensed over a wide width, and this is very often very inappropriate for the application of streaking as it is presently preferred by potential users of the system.

5

A more effective answer is that illustrated by United States patent no. 4,516,591 in the name of Hierholzer.

10

This arrangement, however, proposes to apply bleach or tint selectively to strands of hair by causing adjacent strands to be at a different height as they pass through the comb shape of the applicator.

15

A first somewhat surprising difficulty with this arrangement is that each delivery aperture, passing through a substantial length of the base, will provide for the potential of very great losses along this full length with substantially viscous materials, and the problems with this is that different materials and significantly very slight changes within a given consistency, can be caught in one of the apertures causing very significant changes in flow in that aperture as compared to others.

20

The next difficulty is, however, that when it is being used, the hair strands that are being coated are being pressed below those which are not.

25

It therefore becomes very difficult to actually see the amount of liquid being dispensed onto the underneath strands in that the upper strands simply hide this from view, or at least cover some of this from view, to the extent that over or under treatment is extremely difficult to assess.

30

Further, it is a very difficult technique to assess the quantity of liquid that has to be dispensed so that this will not excessively mix with the remaining non treated strands of hair recalling that the treated strands are pressed more than the untreated strands during the treatment process, and that the hair would normally be being held by the hand of the operator.

35

This means that when the treated hair is released, it will be modestly slacker than the untreated hair and hence somewhat more difficult to control in not spreading the material after application.

5 While attempts have been made to propose different techniques for isolating the hair and applying the streaking material, none has been found to be satisfactory up to the present time and it is accordingly an object of this invention to propose a hair treatment liquid delivery apparatus which indeed will be more useful in assisting controlled  
10 delivery of such liquid in a way which reduces the problems hitherto experienced.

The invention can accordingly be said to reside in a hair treatment liquid delivery apparatus comprising a body including a container, the walls of  
15 the container providing by reason of the material and the shape and thickness of at least side walls of the container, a resilience therebetween to allow substantial resilient closure under finger pressure, an adapter engaging across a mouth of the container and held therewith with a sealing connection by interlocking engagement with the container,  
20 the adapter including an open mouth at the apex of a converging shape, and a hair treatment liquid delivery member interlockably engaging with and having a sealing connection with the otherwise open mouth of the adapter, the hair treatment liquid delivery member including an outlet for delivery of liquid within the container through applicator means.

25 In preference, the container comprises a back wall, two oppositely located side walls, and two oppositely located end walls joining between the side walls and the back wall so that it is the resilience between the two side walls which allows for substantial resilient closure under finger  
30 pressure.

By providing that the container is separate from an adapter, the two articles can therefore be made from different materials and in a different way ensuring therefore that while the container can be resilient, the  
35 adapter can be made of much more rigid material and a seal can be

therefore kept between the two while allowing for the substantial resilience to provide for adequate forcing of liquid through the adapter from the container.

5 In preference, the hair treatment liquid delivery member comprises an elongate base, and the applicator means comprise a plurality of teeth aligned to extend from the base and arranged in comb like arrangement along the elongation direction of the base leaving thereby a slot between each pair of adjacent teeth and a hair treatment liquid delivery aperture  
10 extending from a top of the slot for each of at least two of the slots, through the base.

In preference, there are a large number of such teeth and a much larger number than two hair treatment liquid delivery apertures, and in an  
15 embodiment there are nine such apertures so that the width that can be thereby serviced in one pass with treatment liquid can be approximately 7 centimetres.

In an alternative arrangement, the hair treatment liquid delivery member  
20 comprises a brush applicator which in turn includes an applicator body, a first end of the applicator body interlockably and sealably connected to an apex of the adapter, a brush including a brush body and a plurality of bristles secured at an inner end to the brush body positioned within the applicator body and such that the bristles of the brush project through an  
25 aperture at the apex of converging inner surfaces which aperture is also a delivery outlet aperture for hair treatment liquid from the container.

A significant advantage of this arrangement is that the hair treatment liquid can be forced to pass through and between all of the bristles as it  
30 passes through the delivery outlet aperture so that all of the bristles, or particularly all of the ends of each of the bristles, can be continuously coated with hair treatment liquid.

A particular advantage of this arrangement is that such liquid insofar that  
35 it is normally susceptible to oxidation once exposed to the air, can be

kept generally away from air until a final issue from the outlet aperture thus making for a very efficient delivery system.

5 In another form, the invention can be said to reside in a hair treatment liquid delivery apparatus comprising a container adapted to hold hair treatment liquid, and hair treatment liquid delivery means removably interconnected to the container and including a plurality of teeth supported on a base and arranged in parallel alignment one with respect to the other, each being separated one from the other by a slot, and a  
10 plurality of hair treatment liquid delivery apertures extending through the base and having an outlet in a top of each of the selected slots.

In a further form, the invention can be said to reside in a hair treatment liquid delivery apparatus comprising a container adapted to hold hair  
15 treatment liquid, and hair treatment liquid delivery means removably interconnected to the container and including a plurality of bristles supported so as to extend through an outlet of the hair treatment liquid delivery member which is also the delivery outlet for hair treatment liquid from the container.

20

A better understanding of this invention will now be gained by reference to preferred embodiments which shall be described with the assistance of drawings in which -

25 FIG. 1 is an exploded view of a first preferred embodiment with part of the container and part of the adapter being cut-away;

FIG. 2 is a cross-section of a part of the applicator means in this first embodiment being a cross-sectional view through the lines B-B as  
30 shown in Fig. 3;

FIG. 3 is a cross-sectional view along the lines A-A as shown in Fig. 1 once again of the adapter;



FIG. 4 is an external perspective view of the first embodiment of the container with the adapter and applicator means;

5 FIG. 5 is a further perspective view of the same embodiment as in Figs. 1, 2, 3 and 4;

FIG. 6 is a cross-sectional view through the container and adapter according to the first embodiment;

10 FIG. 7 is a cross-sectional view through a closure cap;

FIG. 8 is a further cross-sectional view of the closure cap as shown in Fig. 7;

15 FIG. 9 is a cross-sectional view in the opposite direction of the container and adapter as shown in Fig. 6;

FIG. 10 is a cross-sectional view of an applicator means;

20 FIG. 11 is a cross-sectional view along the lines 11-11 as shown in Fig. 10;

FIG. 12 is a perspective view of this first embodiment being used in conjunction with hair in the act of applying bleach;

25

FIG. 13 is a perspective view of a second embodiment of applicator means comprising a brush within a converging housing;

FIG. 14 is a side cross-sectional view of the arrangement as in Fig. 13;

30

FIG. 15 is a perspective view showing partly the inside of such an arrangement as in Figs. 13 and 14;

FIG. 16 is a plan view of this; and

35

FIG. 17 is a perspective view of this.

Referring in detail to the drawings, and in particular the first embodiment as generally set out in Figs. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12, the  
5 apparatus 1 includes a container 2, an adapter 3, and an applicator means 4, there being a plurality of teeth 5 and apertures 6 passing through the applicator means.

In addition, there is a lid or cover 7 which can be used to close the  
10 container by interlocking with the adapter 3 so as to provide sealing of the container 2 when any mixture in the container 2 is to be mixed or to be stored.

The container 2 is made from injection moulded plastics material and it  
15 has a shape and wall thickness such that the two side walls 8 and 9 can be readily caused to resiliently flex under conventional finger pressure by an adult holding the container.

In order to assist this effect, the two sides 8 and 9 are both wide and deep  
20 and have a relatively thin cross-section, the shape further being defined by end walls 10 and 11 which are oppositely located and a back wall 12 leaving thereby an open mouth 13.

The peripheral edge of the container 2 defining the open mouth 13 at 14  
25 includes outwardly extending tongues 15, 16, 17 and 18 which are arranged to fit within a matching slot 19 with a tight fit and interlockably engaging by reason for instance of tongue 15 fitting beneath tongue 20 within the slot 19.

It is a significant difficulty that having flexible side walls 8 and 9, means  
30 that as these do flex, it is important to keep a sealing connection between these and the adapter 3.

The adapter 3 has inwardly converging sides which are more clearly shown in Figs. 6 and 7 at 21 and 22 which has the result, especially with very thick or viscous bleach or tint materials, to cause any developed pressure from the somewhat larger cross-sectional area of the container, to assist in concentrating but at the same time provide reasonably uniform pressure so that the rate of exudation of the liquid will be substantially uniform through each of the apertures 6.

Referring specifically to the applicator means 4, this includes an elongate base 23 the total length of which from end to end is selected so that the plurality of teeth 5 will extend across a length approximately that of the length of an adult finger.

This on average is about 7 centimetres and the relevance of this feature relates to the technique by which the device will be used.

This inherently involves capturing the hair between a forefinger and a second finger of the person using the device and it is relatively important that in so handling the hair, that the hair is pulled more or less parallel from the scalp.

If the apertures 6 are more widely positioned so that from end to end it is a distance longer than this distance, namely 7 centimetres, one or more of the apertures will not have hair passing adjacent the outlet so that liquid being pushed through this will not be used and will either build up and drip into other parts of the hair, or will have to be continuously cleaned by the operator.

Both of these results cause great difficulties.

A second problem, however, is that the material that is used, for instance to bleach, must be applied relatively quickly over all of the hair because once applied to the hair, the bleaching process commences and it is

significantly preferable that the same period for bleaching be used for all of the hair.

- 5 If the width of the base of the applicator means is significantly less than this distance, it then causes significant increase in the time that is necessary for the apparatus to indeed individually coat spaced apart strands of the hair.

The next problem relates to the teeth 5.

10

It has been found that there is significant value in providing a somewhat wider slot such as at 24 and 25 into which at the base, the aperture 6 has its outlet.

- 15 At the same time, adjacent teeth such as 26, have a slot such as at 27, 28 and 29 therebetween, all having the same height as the slot 25 or 24.

- 20 Further, however, the slot such as at 27, 28 and 29 is significantly narrower than the slot 24 or 25 and the slot is also tapered so that hair that is gathered at the wider mouth between teeth, for instance 26 and 27, is gathered to be further distanced from the outlet aperture of the aperture 6 while the hair that is within the slot 24 will be kept more or less flat against the top edge and therefore fully exposed to the material or liquid coming from the aperture across the width of the thus formed hair.

25

Nonetheless, the heights in both cases are such that it will be much easier to watch the exuding liquid and this in comparison to the material which is not intended to be treated.

- 30 By locating groups of teeth such as 26 in groups of four between the much wider slot 24 has assisted in keeping the hair not being treated from being kept more tightly under pressure and this is particularly the case where the apparatus is being used toward the end of the hair so that as the ends of the strands of hair pass through between the teeth,

there is more opportunity that these are kept separate from the treated strands.

5 It will be evident from the drawings, but it is stated explicitly nonetheless, that there are a plurality of groups of teeth these being shown in each case at 5, each of the teeth being wider at a space such as at 30 than at the tip 31, the height of each of the teeth being the same and each of the groups of teeth being comprised of the same number of teeth and of the same height throughout the elongate length of the applicator means 4.

10 The applicator means includes a peripheral slot 31 which co-operatively engages with inwardly extending lips 32 and 33 whereby there is provided both an interlocking effect and a sealably engaging effect between the apex 34 of the adapter 3 and the applicator means 4.

15 At the end 35 there is a closure plate 36 which co-operates with an open aperture area 37.

20 The lid or closure cap 7 has a similar arrangement including a peripheral slot 37 and an end 38 which likewise co-operates when needed to provide an interlocked and sealing closure of the otherwise open mouth at the apex 34 of the adapter 3.

25 Fig. 12 illustrates the way in which the apparatus will be used and in particular there is shown the hand 39 of the hairdresser being able to snugly hold the apparatus 1 and by convenient location of the fingers such as at 40 and the reacting pressure of the thumb 41, apply modest pressure against the sides 8 and 9 and thereby cause the exudation of the reasonably thick material into the separated strands such as at 42 of  
30 the hair 43.

An important feature here, however, is that the hair that has been gathered is gathered by the hand 44 and held generally parallel between the forefinger 45 and the second finger 46.

35

Accordingly it will be seen that by using this technique of fingers, it is the width of the fingers of the normal hairdresser that will determine the width of hair that can be treated effectively at one pass and hence which most effectively determines the width of the treating apertures 6.

5

Referring now to Figs. 13, 14, 15, 16 and 17, these drawings illustrate a brush applicator 47 which includes an applicator body 48 which is adapted by reason of a slot extending around the periphery 49 to slide and thereby sealably interconnect with the aperture at the apex 34 of the adapter 3.

10

The inner surface of the applicator body at 50 is inwardly converging to an outermost aperture at 51.

15 Located within the applicator body 48 is a brush body 52 which is interlocked in position by wings 53 engaging detents 54 and otherwise having shoulders 55 and 56 resting on the inside of the applicator body 48.

20 The bristles 57 are held in tufts and are anchored substantially within the applicator body 48 so that there is ample access such as at 58 past the anchorage point 4 of viscous liquids such as tint or bleach and thus therefore that such materials will be forced to merge between the bristles as they exit from the aperture 51.

25

The part of the bristles 59 which protrude from the applicator body are kept relatively short.

A finger 60 interlockably engages stub 61 on the applicator body 48.

30

The finger 60 is used by the hairdresser to lift and divide hair during the touch-up process.

35 This device or attachment is used for touch-up purposes where tint or bleach is to be used to touch-up the roots of a person's hair.

- By having only a short part of the bristles extruding from the otherwise enclosed applicator body 48, reduces exposure of the bleach or tint to the air thus allowing this to remain active for a much longer period of time, and of course also providing a much greater reservoir of material at the location when it is needed by the hairdresser.
- 5

## THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A hair treatment liquid delivery apparatus comprising -  
a body including a container the walls of the container providing  
5 by reason of the material and the shape and thickness of at least side  
walls of the container, a resilience therebetween to allow substantial  
resilient closure under finger pressure,  
an adapter engaging across a mouth of the container and held  
therewith with a sealing connection by interlocking engagement with  
10 the container, the adapter including an open mouth at the apex of a  
converging shape,  
and a hair treatment liquid delivery member interlockably  
engaging with and having a sealing connection with the otherwise  
open mouth of the adapter, the hair treatment liquid delivery member  
15 including an outlet for delivery of liquid within the container through  
applicator means.

2. A hair treatment liquid delivery apparatus comprising -  
a body including a container comprising a back wall,  
20 two oppositely located side walls, and two oppositely located  
end walls joining between the side walls and the back wall,  
and an open mouth oppositely located to the back wall, the walls  
providing by reason of the material and the shape and thickness of at  
least one of the side walls a resilience between the two side walls to  
25 allow substantial resilient closure between the two side walls under  
finger pressure,  
an adapter engaging across the mouth of the container and held  
therewith with a sealing connection by interlocking engagement with  
the walls of the container, the adapter including an inwardly converging  
30 inner wall surface shape, and an open mouth at the apex of the  
converging shape,  
and a hair treatment liquid delivery member interlockably  
engaging with and having a sealing connection with the otherwise  
open mouth of the adapter, the hair treatment liquid delivery member  
35 including an outlet for delivery of liquid within the container through  
applicator means.



3. A hair treatment liquid delivery apparatus as in the preceding claim in which the hair treatment liquid delivery member comprises -

an elongate base,

5 and the applicator means comprise a plurality of teeth aligned to extend from the base and arranged in comb like arrangement along the elongation direction of the base leaving thereby a slot between each pair of adjacent teeth,

10 and a hair treatment liquid delivery aperture extending from a top of a slot for each of at least two of the slots through the base .

4. A hair treatment liquid delivery apparatus as in the last preceding claim in which the hair treatment liquid delivery member is further characterised in that the teeth are arranged in groups with  
15 different slot widths and in which the slots between adjacent teeth are wider where the slot has at its base a hair treatment liquid delivery aperture than the width of each slot between teeth without the hair treatment liquid delivery aperture.

20 5. A hair treatment liquid delivery apparatus as in any one of preceding claims 3 or 4 wherein the elongate base has a length comprising approximately that of an adult forefinger.

25 6. A hair treatment liquid delivery apparatus as in the last preceding claim wherein the length is approximately 7 centimetres.

7. A hair treatment liquid delivery apparatus as in the last preceding claim in which the hair treatment liquid delivery member is further characterised in that the teeth in groups comprise the same  
30 number of teeth in each group and each group is separated by a slot of larger width than the slot between each group and in which the slot between each group has a hair treatment liquid delivery aperture.

35 8. A hair treatment liquid delivery apparatus as in the last preceding claim in which the hair treatment liquid delivery member is further characterised in that the height of each of the slots between the

teeth in each group is the same as the height of each slot between each group.

5 9. A hair treatment liquid delivery apparatus as in claim 1 further characterised in that the hair treatment liquid delivery member comprises a brush applicator.

10 10. A hair treatment liquid delivery apparatus as in the last preceding claim further characterised in that the brush applicator includes - an applicator body,

a first end of the applicator body interlockably and sealably connected to the apex of the adapter,

15 a brush including a brush body and a plurality of bristles secured at an inner end to the brush body positioned within the applicator body and such that the bristles of the brush project through an aperture at the apex of converging inner surfaces which aperture is also a delivery outlet aperture for hair treatment liquid from the container.

20 11. A hair treatment liquid delivery apparatus as in the last preceding claim further characterised in that the bristles are held in tufts by the brush body.

25 12. A hair treatment liquid delivery apparatus as in the last preceding claim further characterised in that the brush body is removably located within the brush applicator body.

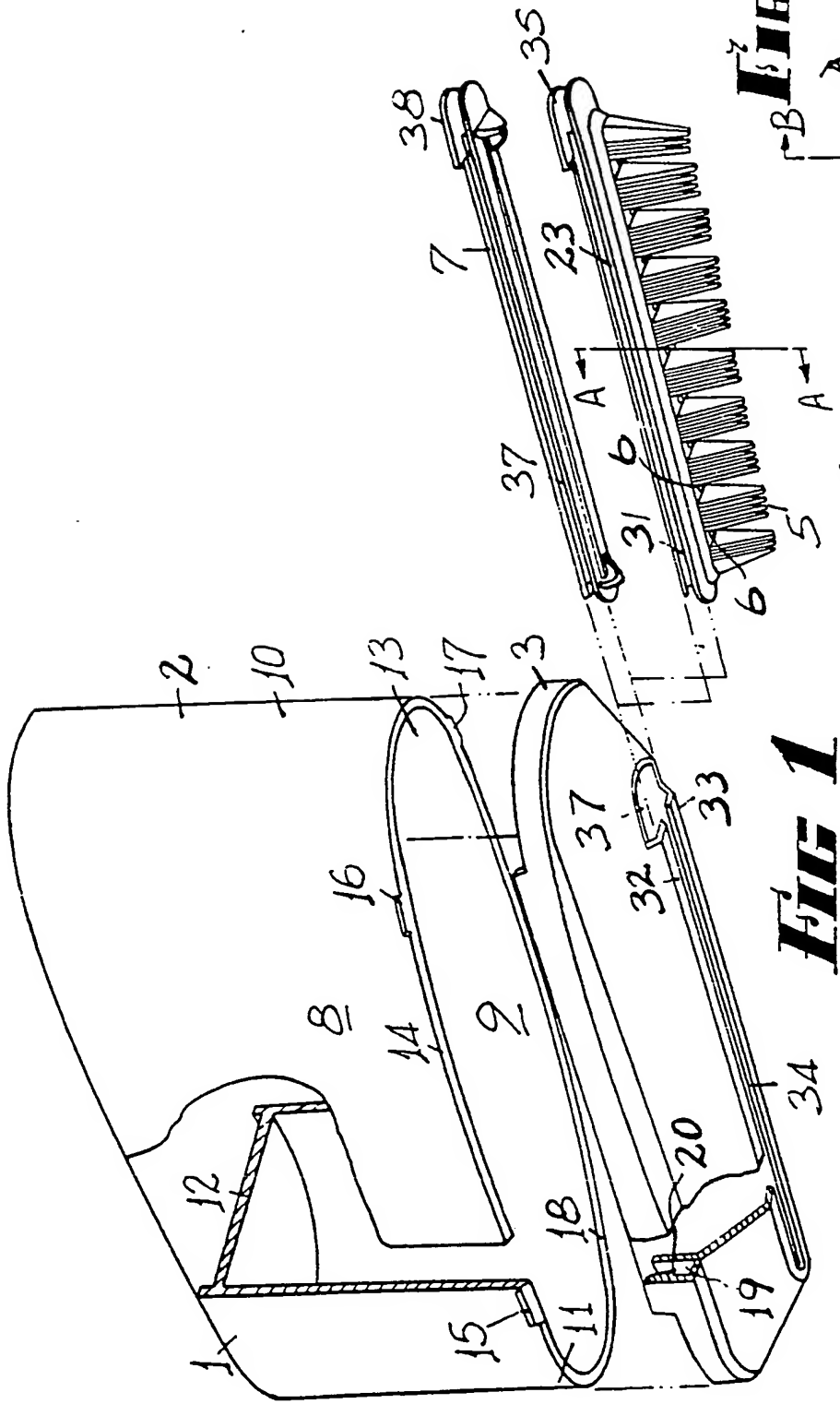
30 13. A hair treatment liquid delivery apparatus as in the last preceding claim further characterised in that the brush applicator body includes an outwardly extending hair pick up finger.

35 14. A hair treatment liquid delivery apparatus as in any one of the preceding claims further characterised in that the hair treatment liquid delivery member is secured to the adapter by an interlocking connection in which the co-operating parts are joined by sliding a first of the parts into a co-operative alignment with the other of the parts.

15. A hair treatment liquid delivery apparatus substantially as described with reference to and as illustrated by the accompanying drawings.

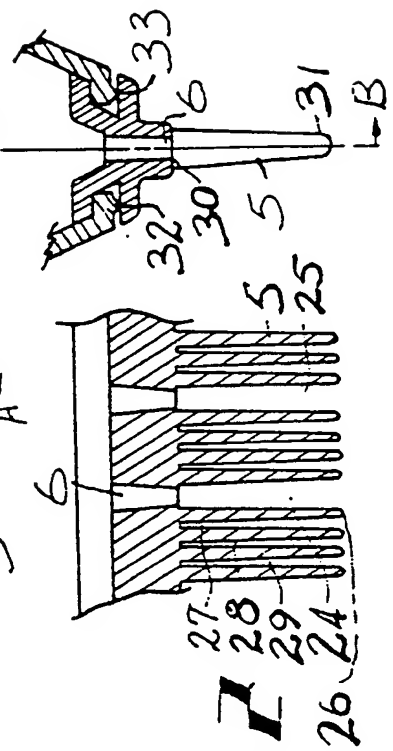
5           16. A hair treatment liquid delivery apparatus comprising a container adapted to hold hair treatment liquid, and hair treatment liquid delivery means removably interconnected to the container and including a plurality of teeth supported on a base and arranged in parallel alignment one with respect to the other, each being separated  
10 one from the other by a slot, and a plurality of hair treatment liquid delivery apertures extending through the base and having an outlet in a top of each of selected slots.

15           17. A hair treatment liquid delivery apparatus comprising a container adapted to hold hair treatment liquid, and hair treatment liquid delivery means removably interconnected to the container and including a plurality of bristles supported so as to extend through an outlet of the hair treatment liquid delivery member which is also a  
20 delivery outlet for hair treatment liquid from the container.



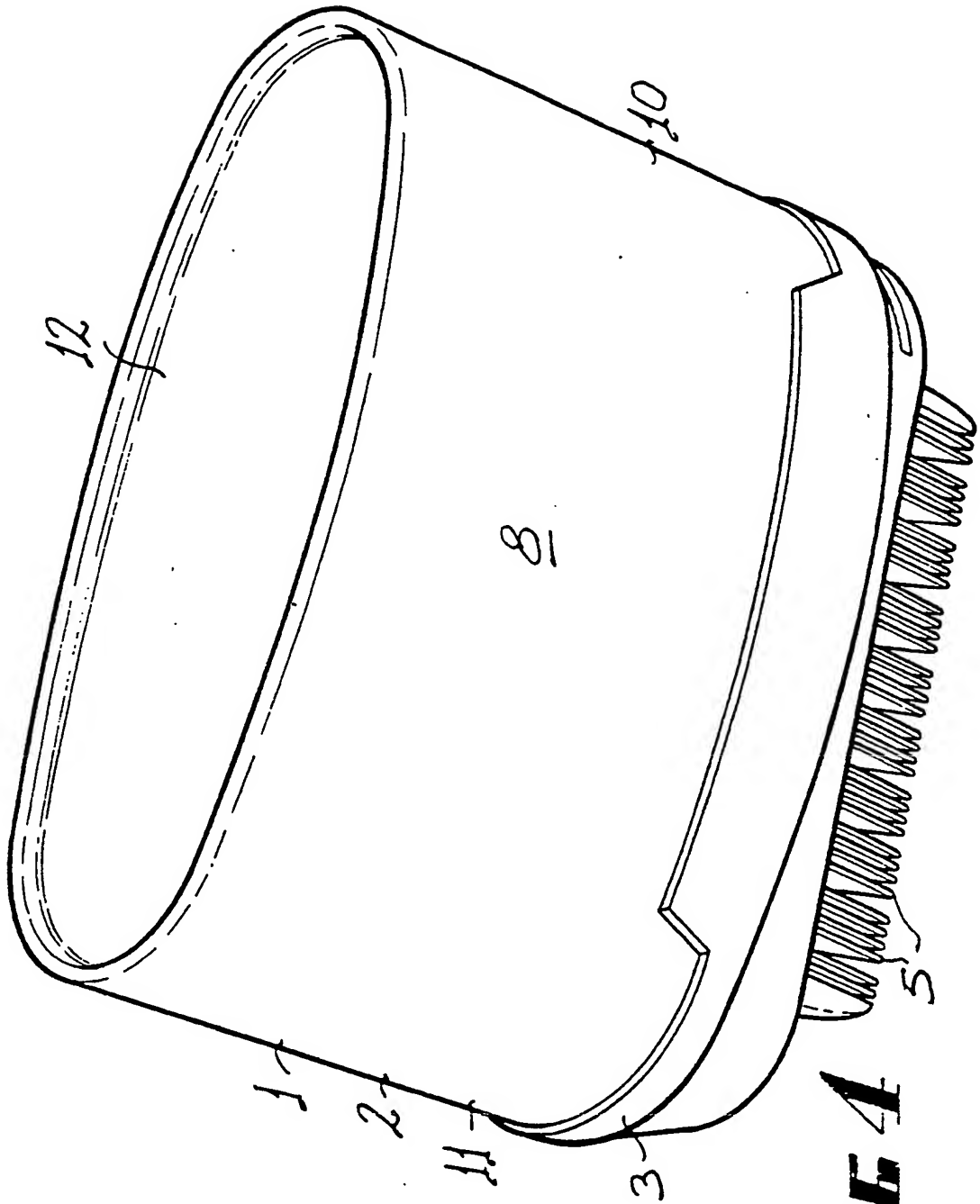
**Fig 1**

**Fig 2**



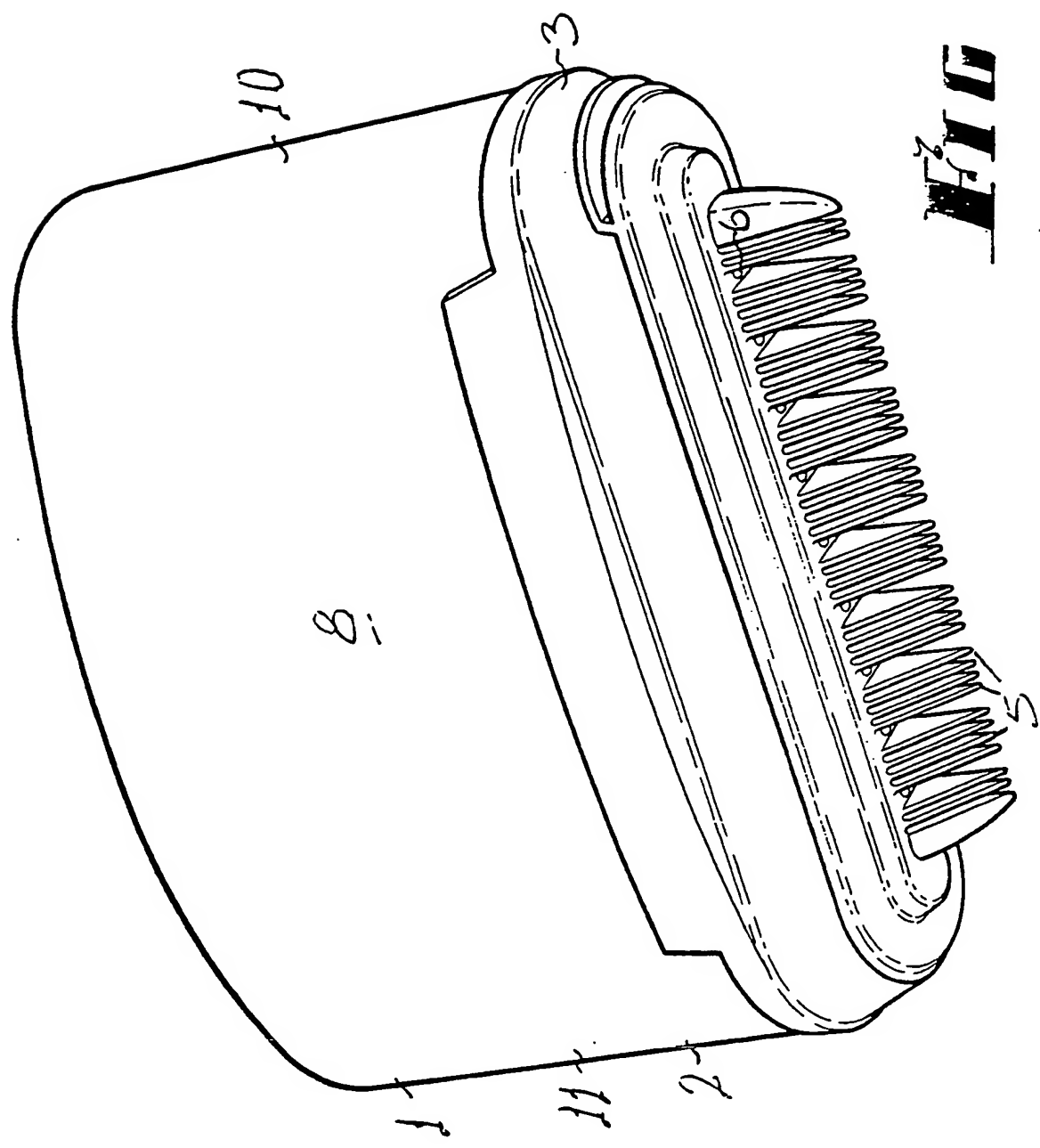
**Fig 3**



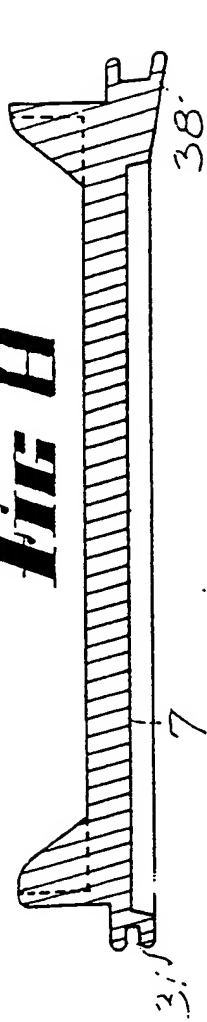


**Fig 4**

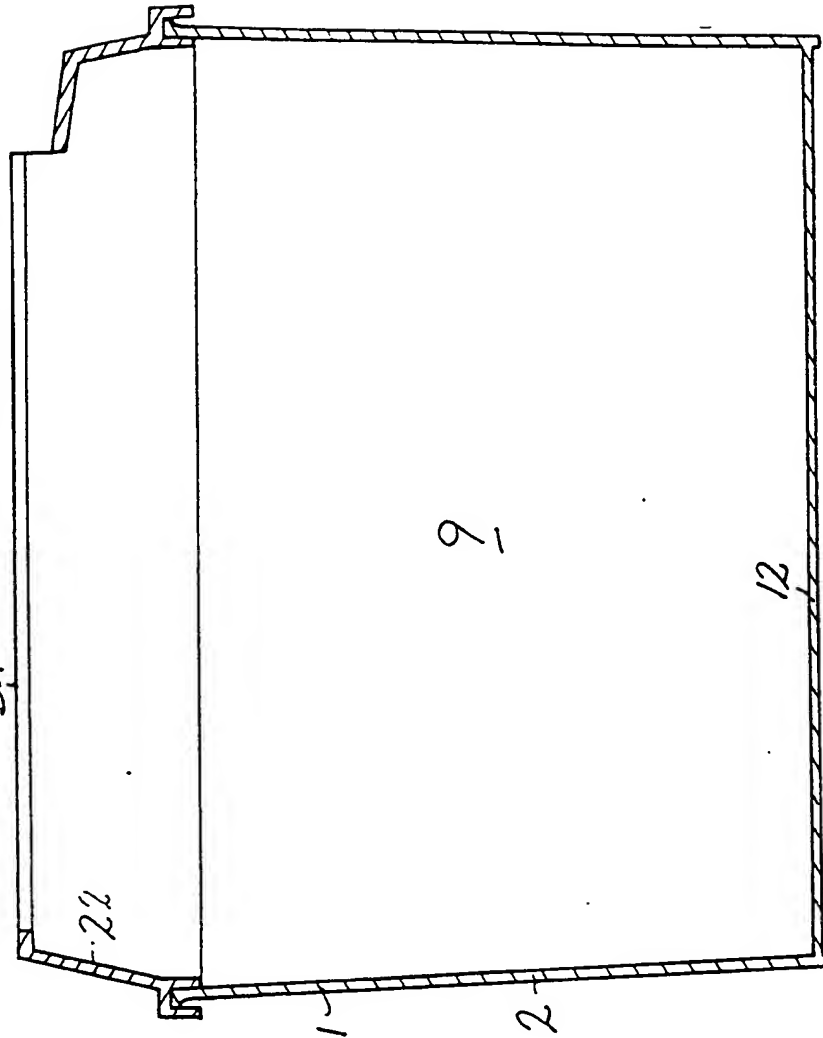
**FIG 5**



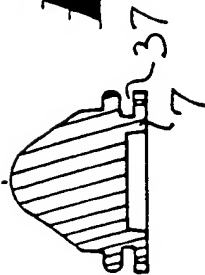
**FIG 8**



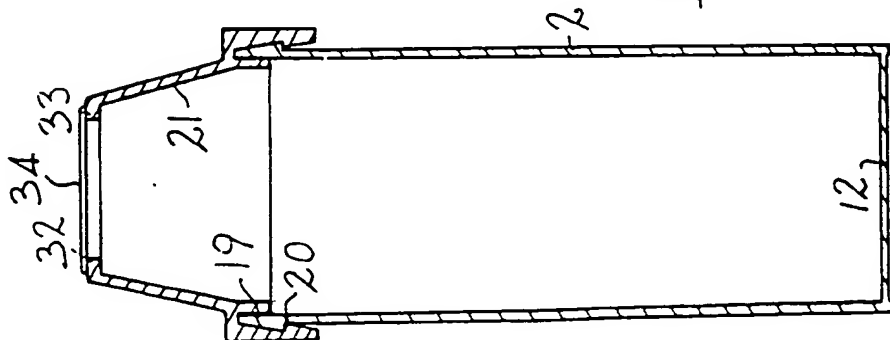
**FIG 9**

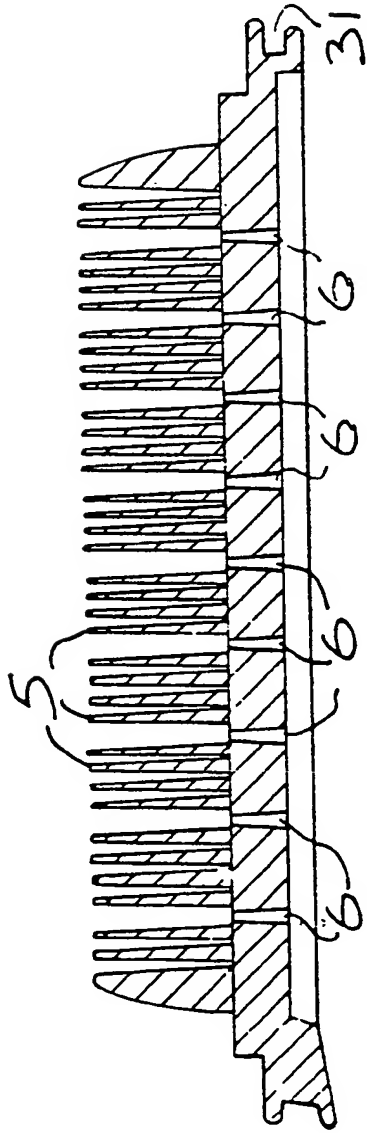


**FIG 7**

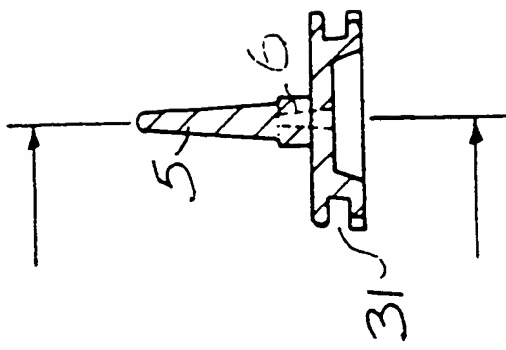


**FIG 6**



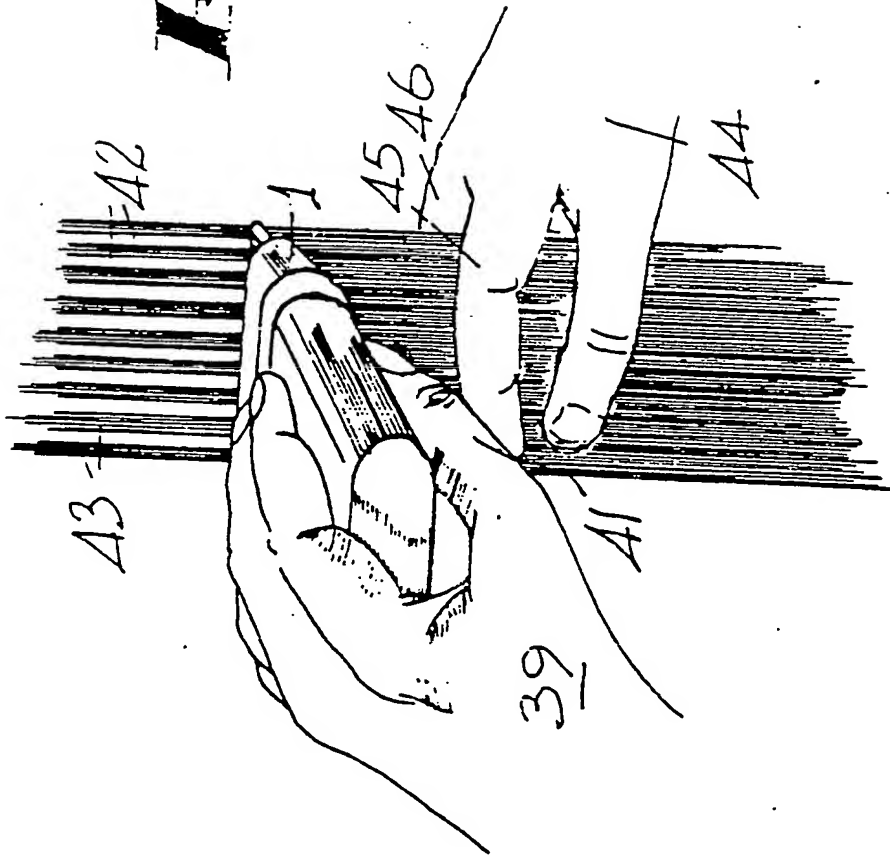


**FIG 1 □**

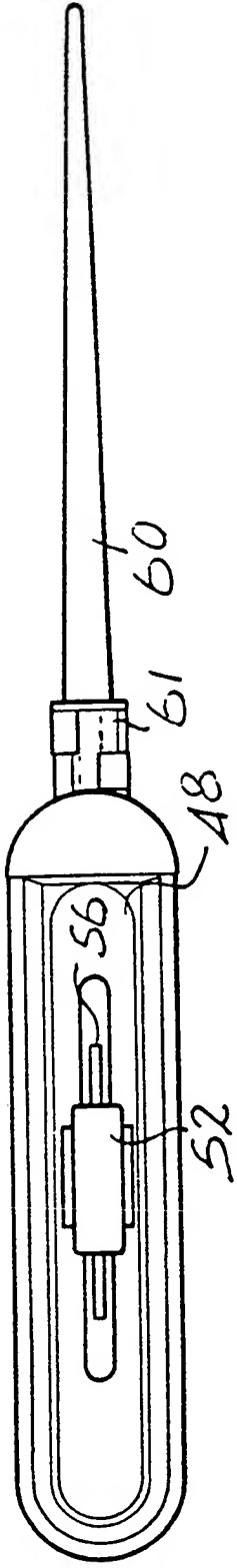


**FIG 1 1**

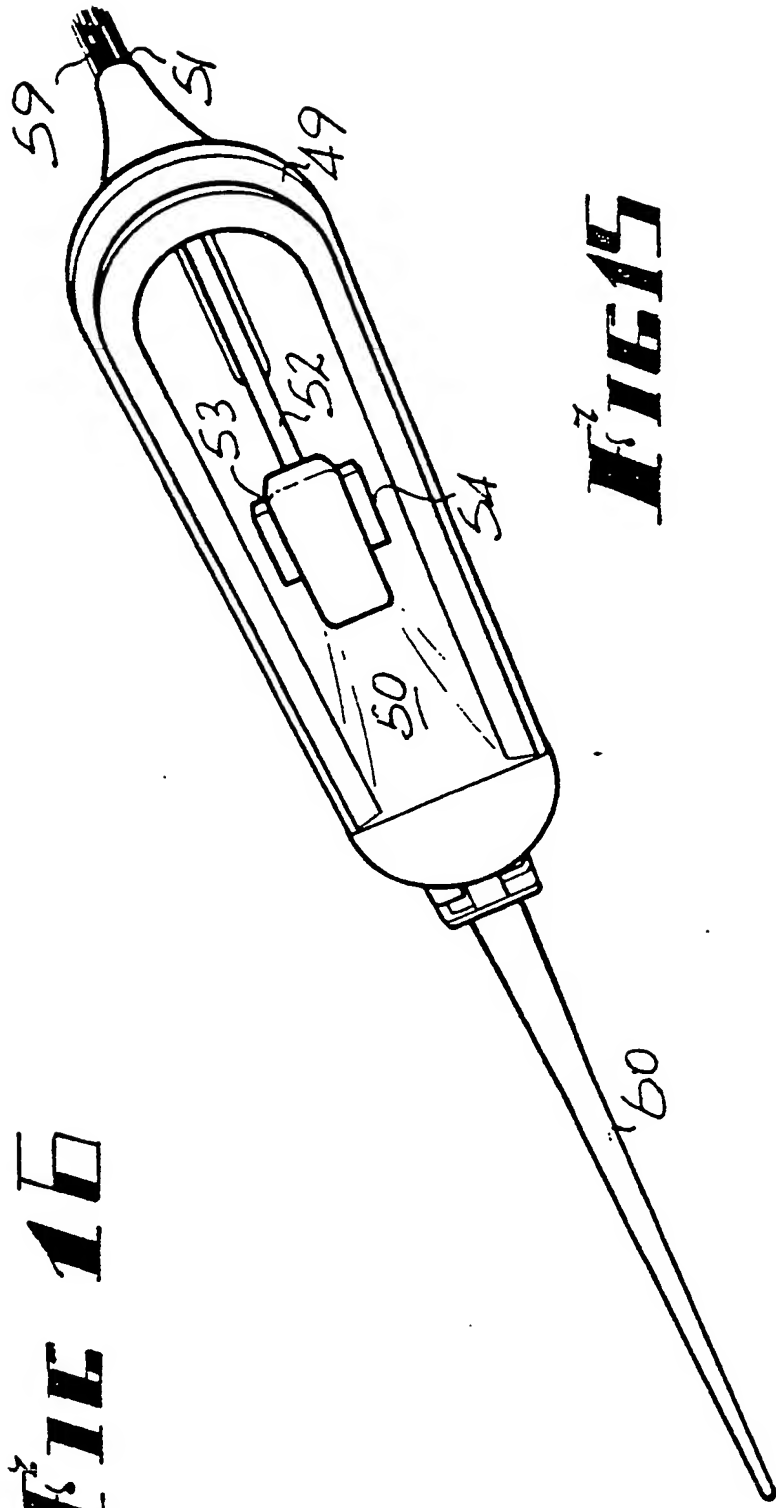


**Fig 11**

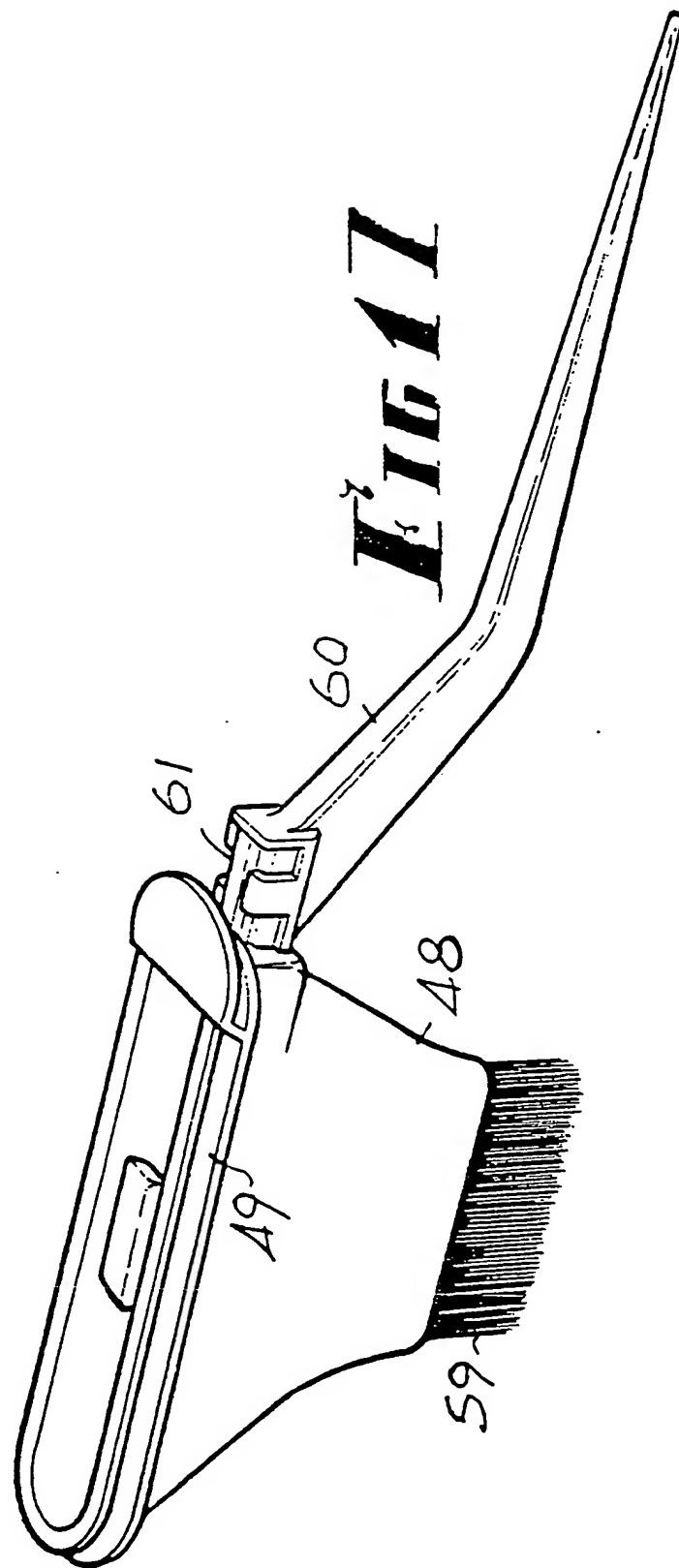




**Fig 16**



**Fig 15**



## INTERNATIONAL SEARCH REPORT

International Application No.

PCT/AU88/00178

## I. CLASSIFICATION OF SUBJECT MATTER : I. Special Classification Symbols apply. Indicate this

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl.<sup>4</sup> A45D 24/26

## II. FIELDS SEARCHED

Minimum Documentation Searched \*

Classification System

Classification Symbols

IPC A45D 24/22 24/24 24/26 24/28

Documentation Searched other than Minimum Documentation  
to the extent that such documents are included in the fields searched \*

AU : IPC as above; A01K 13/00

## III. DOCUMENTS CONSIDERED TO BE RELEVANT \*

Category \* Citation of Document, \*\* with indication, where appropriate, of the relevant passages \*\* Relevant to Claim No. \*\*

- |   |   |        |
|---|---|--------|
| X | AU,A, 25760/67 (MILCZEWSKI) 13 February 1969<br>(13.02.69)  | (1,17) |
| X | AU,B, 76702/81 (527822) (TOKUSHU AEROSOL CO. LTD)<br>30 September 1982 (30.09.82)                             | (17)   |
| X | AU,B, 30556/84(548552) (MISSICH) 19 December 1985<br>(19.12.85)   | (17)   |
| X | AU,A, 49910/85 (BALLAN et.al.) 29 May 1986<br>(29.05.86)  | (17)   |
| X | DE,C, 849296 (ALLWARDT) 13 December 1951<br>(13.12.51)  | (17)   |
| X | DE,A, 2939395 (ROHM) 16 April 1981 (16.04.81)   | (17)   |
| X | DE,A, 3314851 (HEIMBERG) 31 October 1984<br>(31.10.84)  | (17)   |
| X | PATENTS ABSTRACTS OF JAPAN M77 page 5908<br>JP,A, 51-20819 (MATSUSHITA DENKO K.K.)<br>9 March 1977 (09.03.77) | (17)   |

(CONTINUED)

- \* Special categories of cited documents, \*\*
- A- document defining the general state of the art which is not considered to be of particular relevance
- E- earlier document but published on or after the international filing date
- L- document which may throw doubt on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- O- document referring to an oral disclosure, use, exhibition or other means
- P- document published prior to the international filing date but later than the priority date claimed

- T- later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle of theory underlying the invention
- X- document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step
- Y- document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- A- document member of the same patent family

## IV. CERTIFICATION

Date of the Actual Completion of the International Search

8 August 1988 (08.08.88)

Date of Mailing of this International Search Report

(29.08.88) 29 AUGUST 1988

International Searching Authority

AUSTRALIAN PATENT OFFICE

Signature of Authorized Officer

B.R. DASHWOOD

## III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
X	US,A, 2108184 (WALLENIOUS) 15 February 1938 (15.02.38)	(16,17)
X	US,A, 2228213 (HILLSBERRY) 7 January 1941 (07.01.41)	(16,17)
X	US,A, 2626617 (SULLIVAN) 27 January 1953 (27.01.53)	(17)
X	US,A, 2849009 (RIDGEWOOD et.al) 26 August 1958 (26.08.58)	(16,17)
X	US,A, 2897826 (DiVITO) 4 August 1959 (04.08.59)	(16,17)
X	US,A, 2956570 (STANFORD) 18 October 1960 (18.10.60)	(16,17)
A	US,A, 3063085 (THOMAS) 13 November 1962 (13.11.62)	(1)
X,Y	US,A, 3101086 (DiVITO) 20 August 1963 (20.08.63)	(17)
X	US,A, 3520311 (IESERSEK et.al) 14 July 1970 (14.07.70)	(1,14)
Y	US,A, 3754557 (MOORE) 28 August 1973 (28.08.73)	(17)
X	US,A, 4516591 (HIERHOLZER) 14 May 1985 (14.05.85)	(16,17)
X,A	US,A, 4605026 (NOLIN) 12 August 1986 (12.08.86)	(1,2,16,17)
A	US,A, 4617875 (HOLLAND) 21 October 1986 (21.10.86)	(17)

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON  
INTERNATIONAL APPLICATION NO. PCT/AU 88/00178

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Members		
AU 76702/81	JP 57157080 GB 2095103	DE 3147207	FR 2502472	
AU 49910/85	EP 182307			

END OF ANNEX